

Cooperative Institute for Mesoscale Meteorological Studies (CIMMS)

1) Please provide the Mission and a brief history of your Joint Institute (JI).

The mission of the Cooperative Institute for Mesoscale Meteorological Studies (CIMMS) is to act as a research interface between NOAA and the University of Oklahoma and to assist in the transition of research results into operational procedures and techniques. CIMMS provides to the cooperating institutions a means to promote collaborative research on mesoscale meteorological and regional climate phenomena in a broad range of contexts, and especially to enhance the effectiveness of that research by allowing scientists to work advantageously in an environment different from that already provided in the separate Federal and University structures. CIMMS thus seeks to serve as a center of leadership and excellence where scientists may collaborate to learn about and apply their knowledge of mesoscale weather systems and associated regional-scale climate processes.

CIMMS was established in 1978 as a joint program between the National Oceanic and Atmospheric Administration (NOAA) and the University of Oklahoma (OU). CIMMS resides within OU's College of Geosciences and is a member of the Oklahoma Weather Center Program, a unique confederation of federal, state, and university organizations that work together in partnership to improve understanding of the Earth's atmosphere. CIMMS has had a formal affiliation with the National Severe Storms Laboratory (NSSL) since its inception, and has had a formal affiliation with a number of National Weather Service units since 1995. An official relationship with NESDIS began in 2001. The research and development performed within CIMMS are reported in approximately 50 peer-reviewed journal publications each year, and culminate also in highly valued meteorological instrumentation and computer software systems, such as the Weather Event Simulator.

More locally, CIMMS has been a major advocate of the construction of a new "National Weather Center" building on the OU South Campus. This building will house, in a fully integrated manner, all of the University and NOAA-Norman meteorology units linked by CIMMS. The completion of this National Weather Center (NWC) building by early 2006 will place the meteorology program at the University and its NOAA partners in an internationally unequalled and much envied position. The NWC building will allow for greater interaction between federal and university scientists. CIMMS will be heavily involved in NWC implementation during the next three years, including through the CIMMS Director's current role as Associate Director of Oklahoma Weather Center Programs and his proposed new role as Associate Director of the NWC Program that will be housed in the NWC building.

2) What is the total amount of NOAA funding in the last full year of the Joint Institute's (JIs) academic period?

a) Please break out funding provided by Lab/Center.

This information will be provided by John Cortinas and Linda McLaughlin.

b) Please provide the Research themes supported by the funding.

CIMMS research is focused around six themes: (1) basic convective and mesoscale meteorological research (established in 1982); (2) forecast improvements (1990); (3) climatic effects of/controls on mesoscale processes (1990); (4) socioeconomic impacts of mesoscale weather systems and regional-scale climate variations (1993); (5) Doppler weather radar research and development (1995); and (6) climate change monitoring and detection (2001).

c) What percent of your research is short term (0-2 years), medium term (2-5 years), or long term (greater than 5 years)?

Based on FY03 funding, short term research was 5% of CIMMS research, medium term research was 13%, and long term research was 82%.

d) What is the geographic scope of your research – regional, national or global? (Please explain)

The geographic scope of CIMMS research is global. The societal benefits of CIMMS research and development stretch across the U.S. and World – from Cleveland County (Oklahoma) to much of the “Lower 48,” to Japan, Vietnam, Taiwan and to African nations as different as Morocco, Niger and Zambia. CIMMS scientific and support staff teamed with NOAA units have made significant contributions toward the transfer of research knowledge to operational applications, both within and outside NOAA. CIMMS professionals also contribute to the spreading of research applications to the state, national and world. This knowledge transfer enables the American people to make informed decisions regarding public safety/homeland security, economic development, and environmental quality, and is helping to improve the lives of people in developing nations. Examples are given below.

In the regional climate context, CIMMS has focused on (1) identifying the principal patterns of seasonal-to-interannual precipitation and temperature variability for North America east of the Rocky Mountains (including Canada) and parts of Africa north of 10°S (Morocco, Soudano-Sahel zones of West Africa, Gulf of Guinea coastal region, Ethiopia, and Kenya-Tanzania) and (2) linking that variability to global climate system behavior (e.g., sea surface temperature anomaly patterns, El Niño-Southern Oscillation, North Atlantic Oscillation).

On a national level, CIMMS has worked on the following projects. The Warning Decision Support System (WDSS), used to great humanitarian effect by the Storm Prediction Center (SPC) and Weather Service Forecast Office (WSFO) forecasters during the May 3, 1999, tornado outbreaks across the Southern Great Plains, was developed at NSSL with the substantial involvement of CIMMS scientists and computer specialists. The WDSS’s crucial support of the May 3 forecasts by integrating meteorological

information from several different observing systems was a major reason why the loss of life on that day was limited to 43 persons. The WDSS received the Silver Medal from the U.S. Department of Commerce in 1999 for “making significant enhancements to the National Weather Service warning program through developing, testing and transferring tools from a prototype Warning Decision Support System to NWS operational systems.

A residence training program of the Warning Decision Training Branch (WDTB) also is supported by award-winning software developed through a partnership of CIMMS and federal employees. WDTB’s Weather Event Simulator (WES), winner of a rarely awarded Gold Medal from the U.S. Department of Commerce in September 2003, is a tool to practice warning operations in “displaced real time.”

One data set ingested by the WDSS and used regularly in the WES emanates from the Southern Great Plains component of the nationwide WSR-88D radar system. This system is the operational application of basic and applied research into Doppler weather radar that was pioneering at NSSL in the 1970s and 1980s. As a result, the NOAA/CIMMS partnership has resulted in improved detection and warning of severe weather across the U.S. and several foreign countries. Some of the ongoing WSR-88D research and development occurs within CIMMS. Recent work includes pioneering efforts to use dual polarization radar to improve precipitation measurements and hail identification.

In recent years, the WSR-88D focus has been complemented by an initiative that explores the potential for the SPY-1 radar system of the U.S. Navy to be adapted for meteorological use. This initiative is enjoying broad financial support – from NOAA, ONR, State of Oklahoma, OU, FAA, and private industry. The goal is to build a Phased Array Radar (PAR) system that will replace the WSR-88D in 10-15 years. CIMMS engineers and scientists are involved in all aspects of the PAR effort.

Consistent with our long-standing expertise in mobile weather research platforms, NSSL, CIMMS, and OU School of Meteorology teamed with Texas Tech University and Texas A&M University to develop two Shared Mobile Atmospheric Research and Teaching (SMART) Radars. As Hurricane Isabel made landfall in mid-September 2003, both SMART Radar systems monitored the entire hurricane on the coast of North Carolina, providing 14 hours of dual-Doppler coverage of the storm. The data will be used to study the detailed structure of the near-surface winds in the storm as well as how the storm generates a large area of intense rainfall. This information will be used by engineers to improve the structural integrity of buildings, and by meteorologists and hydrologists to improve predictions of the swath of heavy rain and flash floods that often occur within these storms.

At the international level, recent and ongoing CIMMS research has made (or is making) the following additional diverse contributions: (1) determining the implications for the World grain trade of the opposing effects of El Niño/La Niña on sorghum production in Texas and northeastern Australia; (2) assessing the utility of Doppler Weather Radar for electric utility company operations in Kyushu, Japan; (3) producing “Experimental

Precipitation Predictions for Morocco” for use by its government for four winter seasons; (4) assessing the use (and impediments to use) of historical climate information and seasonal climate predictions by the peoples, governments, and non-governmental organizations of Soudano-Sahelian West Africa; (5) providing initial training for Vietnam (Institute of Oceanography, national Hydrometeorological Service) in modern climate dynamics; (6) pioneering the use of new radio, internet, and satellite technologies for communication of weather and climate information to rural communities for sustainable development in six African nations (Senegal, Niger, Chad, Kenya, Zambia, Mozambique); and (7) developing a hydrometeorological decision support system for Taiwan to improve the country’s capability to issue flash flood warnings and to improve their river and reservoir water management. CIMMS now is heavily involved in the planning of a program of African Monsoon Multidisciplinary Analysis (AMMA) that will include a West African Monsoon Experiment in 2006.

3) *What percent of the total Joint Institute funding comes from NOAA?*

For FY03, NOAA provided \$6.9 million (68%) of CIMMS funding.

4) *What is the unique expertise that the JI brings to NOAA (e.g. special scientific skills)*

CIMMS research contributes to the NOAA mission through improvement of the observation, analysis, understanding, and prediction of weather elements and systems and climate anomalies ranging in size from cloud nuclei to multi-state and multi-national areas. Advances in observational and analytical techniques lead to improved understanding of the evolution and structure of these phenomena. Such understanding provides the foundation for more accurate prediction of hazardous weather and anomalous regional climate. Better prediction contributes to improved social and economic welfare. Because small-, meso-, and regional-scale phenomena are also important causes and manifestations of the climate of their locales and beyond, CIMMS research contributes to improved understanding of regional climate variability and change and the functioning of the overall global climate system.

CIMMS provides unique expertise to the nation in the areas of radar meteorology and the study of severe weather. Specifically, these include a means to *promote collaborative research* on mesoscale meteorological phenomena in the following broad range of contexts: associations with a wide variety of severe atmospheric conditions; short-range weather prediction problems; the relation of mesoscale weather systems to regional climate and to processes relevant to possible climate change; the societal impacts of mesoscale weather systems and regional climate variations; and Doppler weather radar research and development, including the development of new radar technologies such as the Phased Array Radar. CIMMS, with NSSL, will be a leader in the development of that technology. CIMMS is also to make strong contributions to field programs studying various aspects of severe weather, notably tornadoes (e.g., VORTEX), lightning (TELEX), and radar studies (JPOLE). Indeed, CIMMS researchers at NSSL have led the way in research to add dual-polarization capability to the WSR-88D, which in coming years will be adapted to the operational NEXRAD system. Recent CIMMS work with

the WDTB is allowing operational weather forecasters to “practice” real-life severe weather scenarios with the Weather Event Simulator, with the goal of preparing them for the actual events when they occur.

5) Please provide a breakdown of staff funded by NOAA (such as scientist, engineers, computer specialists, and administrative). Please include only staff who receive 50% or more of their funding from NOAA.)

Title	Number of Employees
Scientists	37
Computer Specialists	18
Other Technical	6
Undergraduate Student	10
Graduate Student	8
Administrative	4

These numbers are as of February 1, 2004.

For further information, please contact Tracy Reinke, Financial Administrator, CIMMS at (405) 325-3043.